Drive-By-Wire Technology

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Abstract

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Number of Pages
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Topics

- *What is Drive-By-Wire (DBW) Technology?*
- *MPC Products Ground Vehicle Heritage*
- *Pros and Cons of DBW*
- *DBW Applications in Ground Vehicles*
- *Conclusion*

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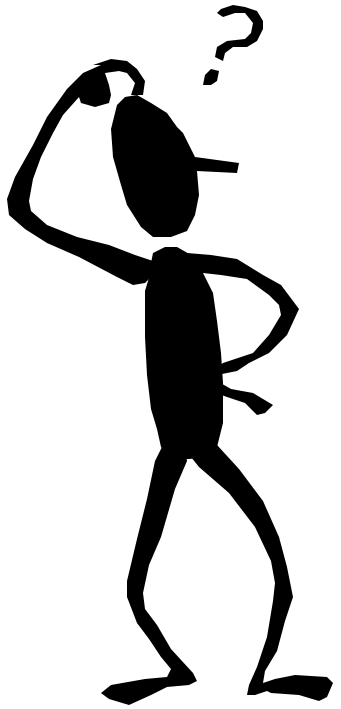
What is Drive-By-Wire Technology?

- **Drive-By-Wire technology is the incorporation of electrical devices to supplant the use of mechanical linkages within a vehicle.**
- **This implementation can use electrohydrostatic, electropneumatic, or electromechanical. The focus of this discussion will be on electromechanical actuation systems.**



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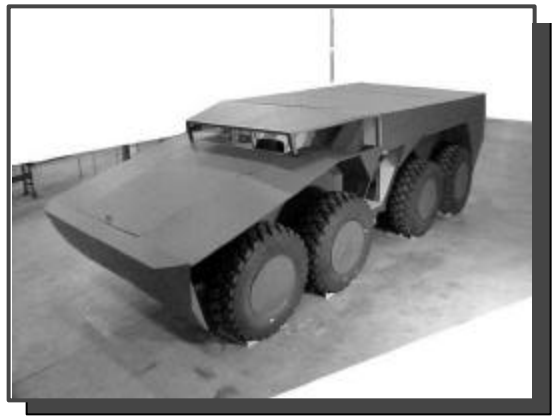
Drive-By-Wire Heritage

Crusader Artillery Vehicle

Vetronics Technology Testbed

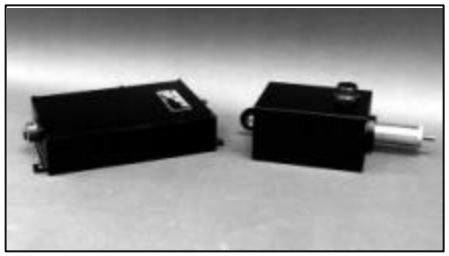
8x8 Advanced Hybrid Electric Drive



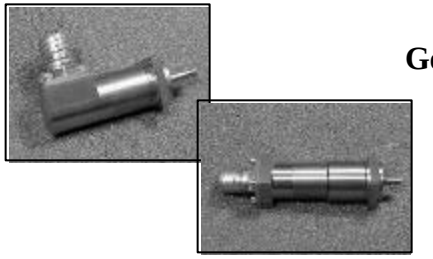
Drive-By-Wire Technology

Crusader Heritage

Driver's Yoke



Service Brake Actuator and Controller



Geared and Non-geared Resolvers

Steering Actuator

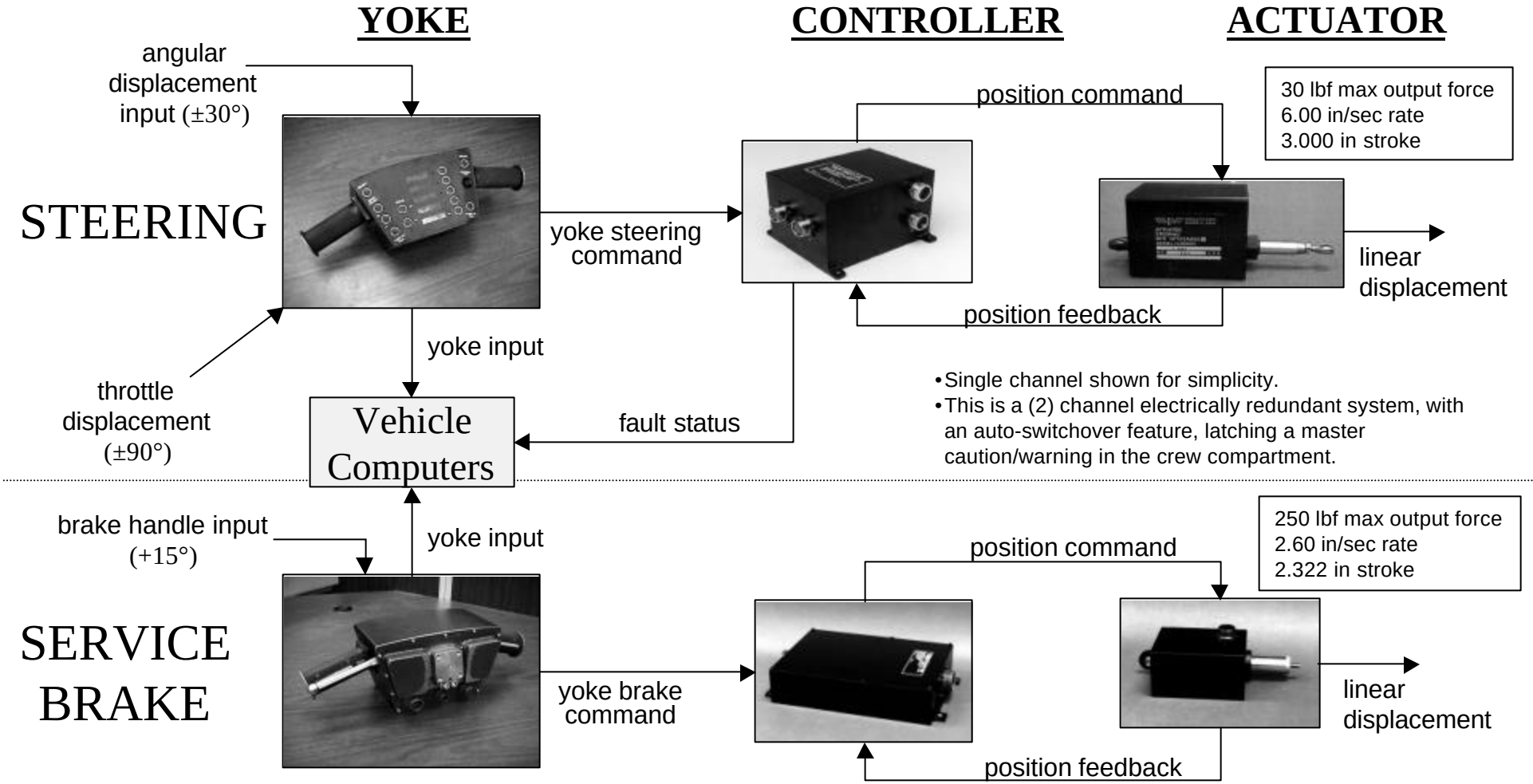
Parking Brake Actuator

Cooling Fans and Controller

Drive-By-Wire Technology

Crusader Simplified System Diagram

Command Inputs



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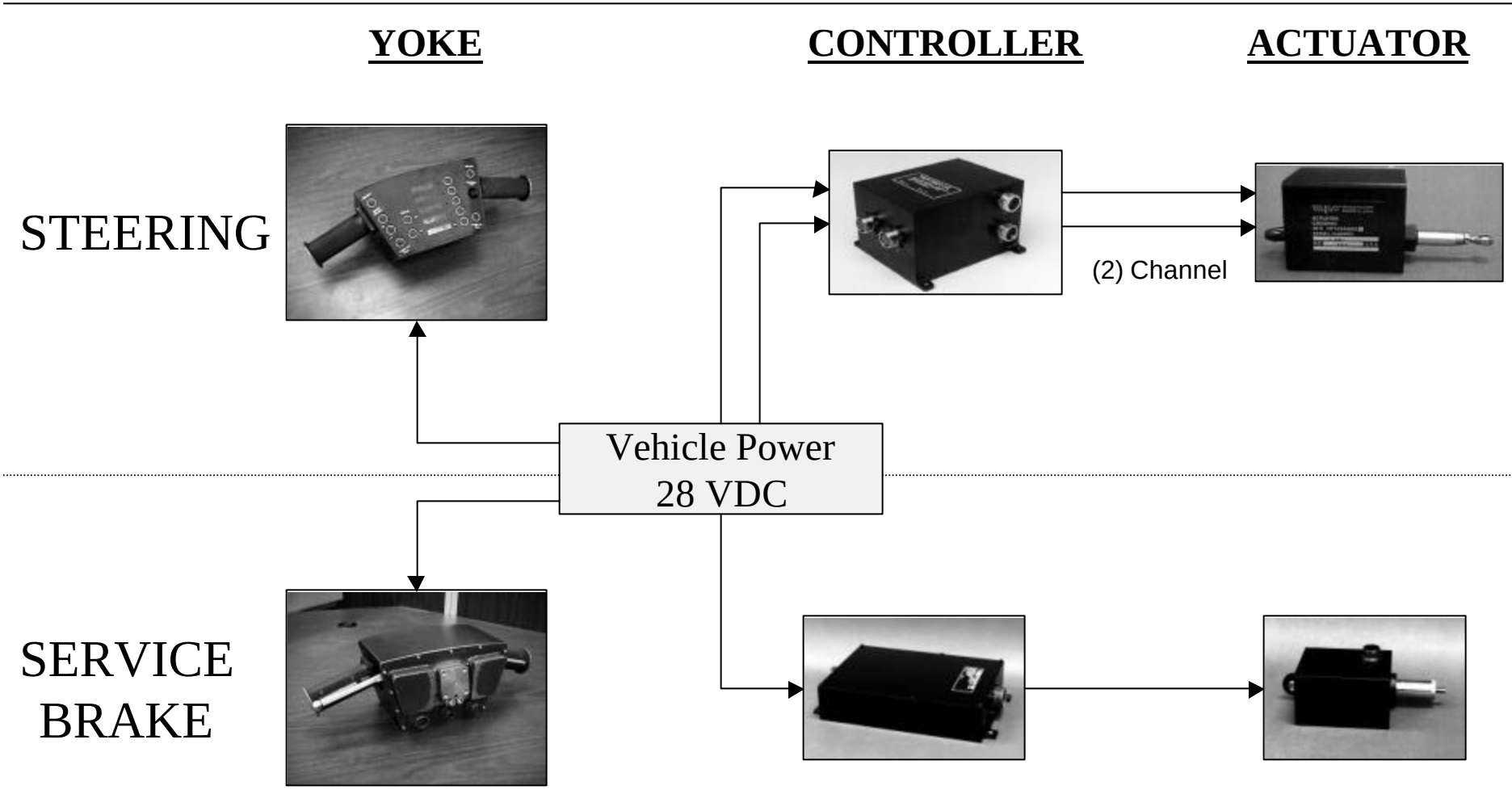
Crusader Simplified System Diagram

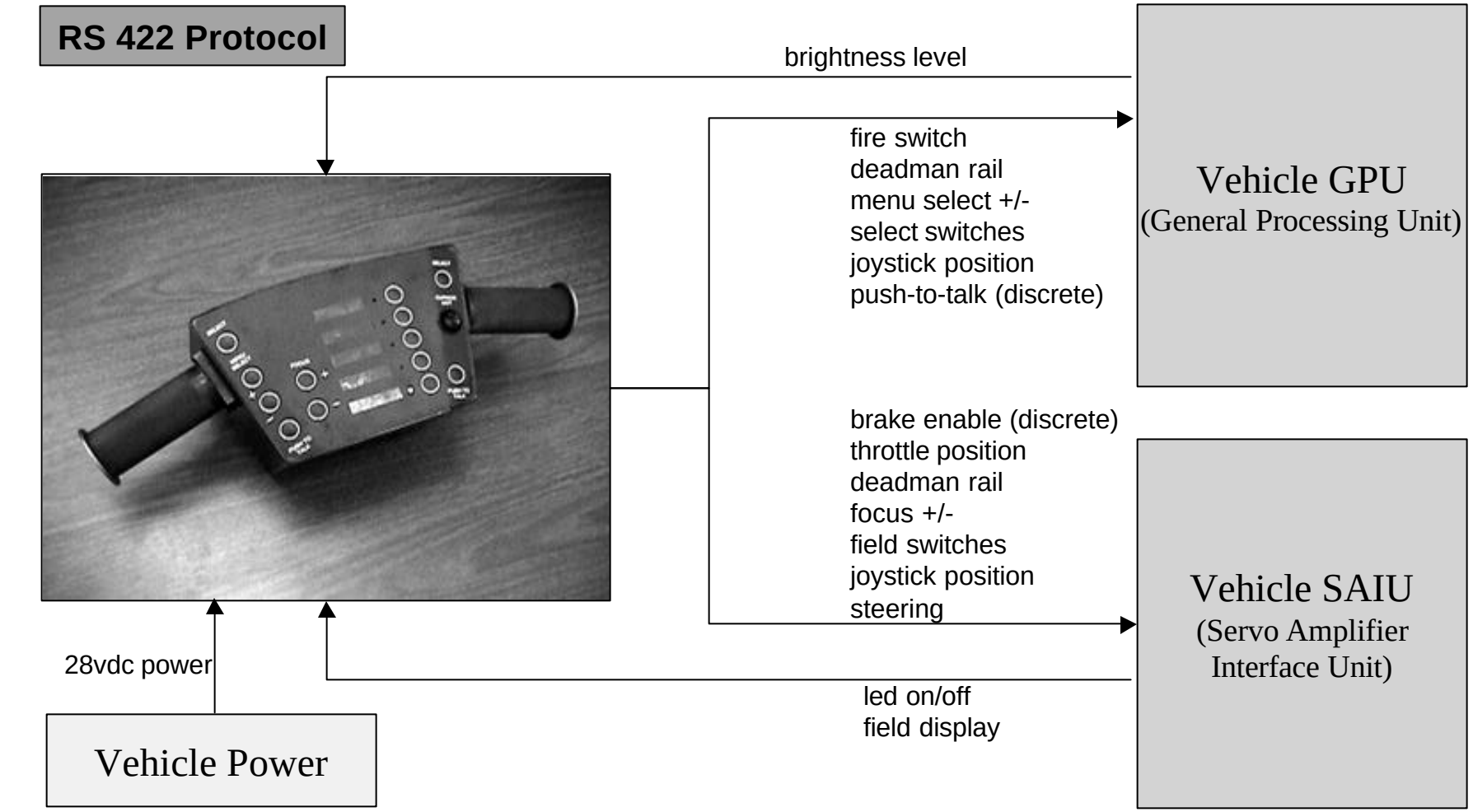
Power Inputs



Drive-By-Wire Technology

Crusader Yoke System Diagram

Yoke/Vehicle Inputs



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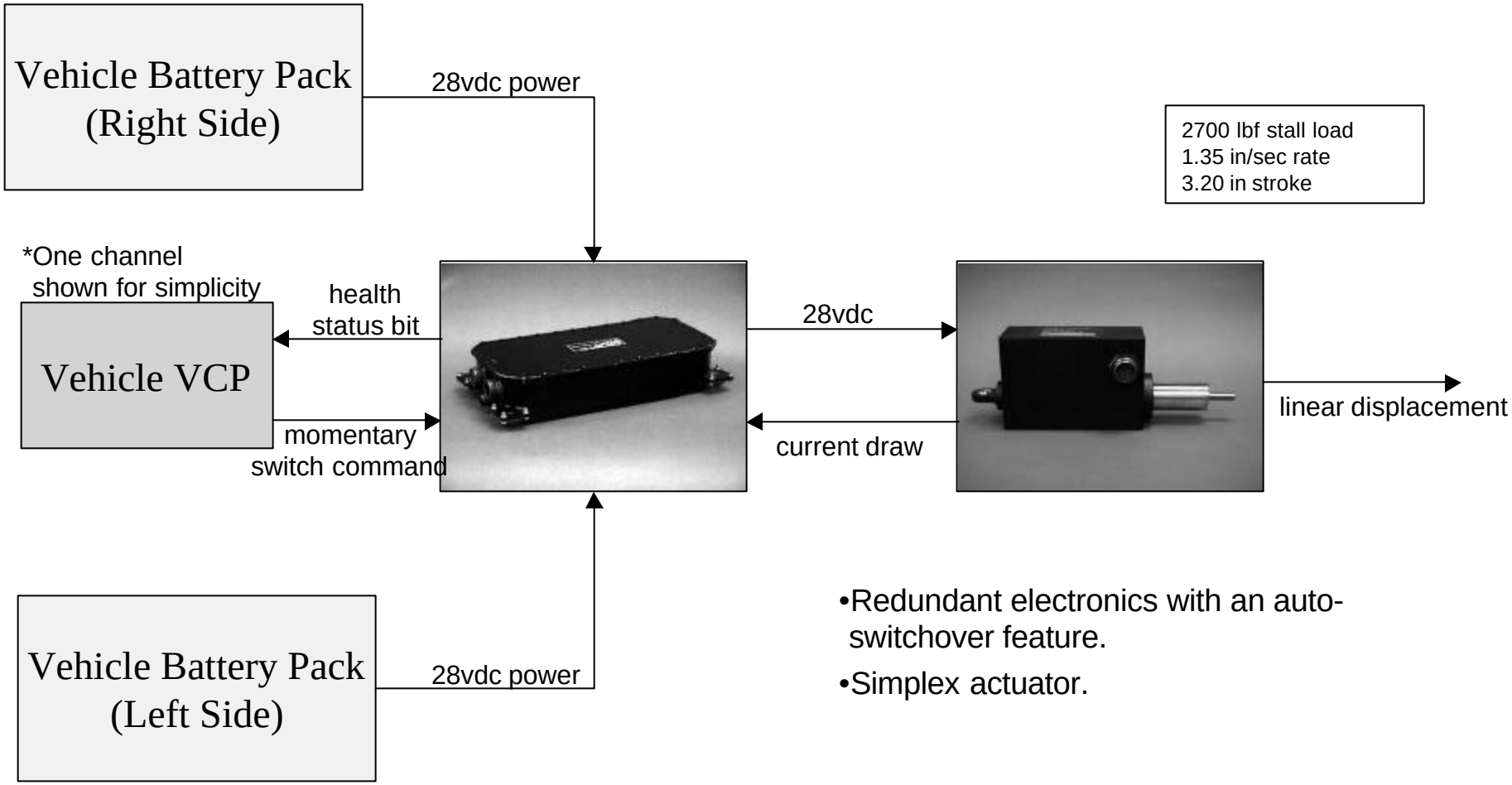
Crusader Simplified Parking Brake System Diagram

Command and Power Inputs



- Redundant electronics with an auto-switchover feature.
- Simplex actuator.

Vetronics Technology Testbed Heritage

2001 Vehicle Technologies Symposium
Intelligent Systems for the Objective Fleet

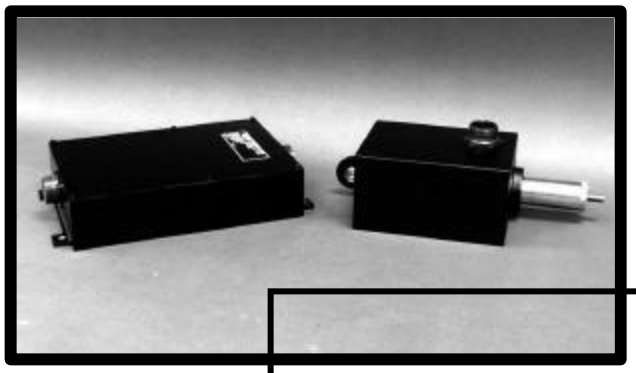
Drive-By-Wire Technology Demonstration Program Adapted for the Bradley Fighting Vehicle

Joint effort with TARDEC and GDLS

Drive-By-Wire Technology

Vetronics Technology Testbed

Simplified System Model



Vetronics Computer (VME)

Brake Control Electronics

Typical for entire system

Position Command

Position Feedback

Brake Actuator

Steering Throttle Controller

Steering Channel

Throttle Channel

Steering Actuator

Throttle Actuator

Transmission F/B Transmission S/S Controller

F/B Channel

S/S Channel

Trans F/B Actuator

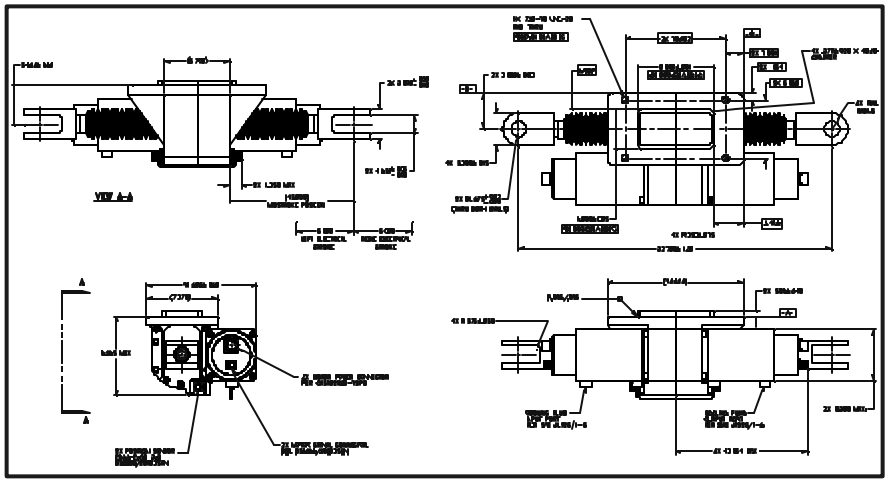
Trans S/S Actuator

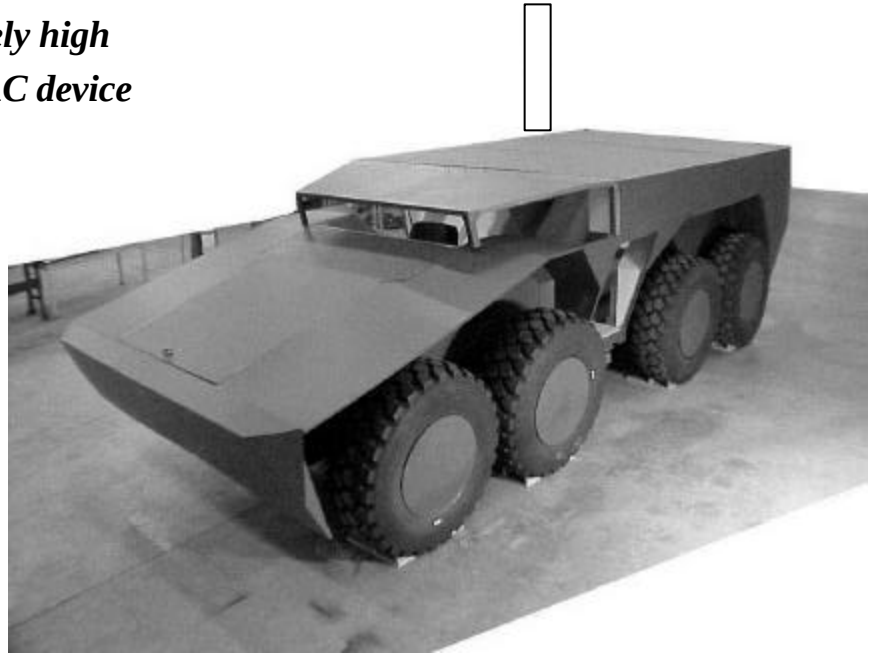
Drive-By-Wire Technology

8x8 Advanced Hybrid Electric Drive

2001 Vehicle Technologies Symposium
Intelligent Systems for the Objective Fleet

MPC is providing to GDLS the Steering Actuator. Under current development, this dual, 18-HP-motor actuator is a dramatic step forward in high-horsepower land vehicle actuation. Exposed to the elements in the undercarriage of the vehicle, this unit experiences extremely high vibration and shock environments. Each motor is an 18 HP AC device supplied by 600 VAC power.





Drive-By-Wire Technology

Drive-By-Wire Pros

- **Ability to tailor the system's characteristics at each point in the vehicle envelope**
- **Increased capability due to fault monitoring and diagnostics**
- **Use of purely electromechanical systems allows for the elimination of environmentally hazardous hydraulic fluids**
- **Reconfiguration to allow mission continuation or safe recovery following system failures or battle damage**
- **Reduced maintenance costs, resulting from the reduction in mechanical complexity and introduction of built-in testing**
- **Reduced operational costs, through improved maintainability and a higher dispatch reliability**

Drive-By-Wire Cons

- **Electromagnetic Interference (EMI)**
- **Nuclear, biological, chemical (NBC) compliance**
- **Wire harnesses: additional weight, assembly, EMI screening**

- **Possible solution? The emergence of drive-by-light could solve EMI and wire harness weight penalties.**

DBW Weight Considerations

Weight reduction due to removal of the mechanical linkages is approximately offset by the additional weight of the electronic boxes of the DBW system.

Replacing an entire hydraulic system with electromechanical is also an approximate even trade.

- **Eliminate hydraulic fluid, lines, and pumps**
- **Gain wire harnesses and control boxes**

The benefit is gained from the increased capability with DBW systems.

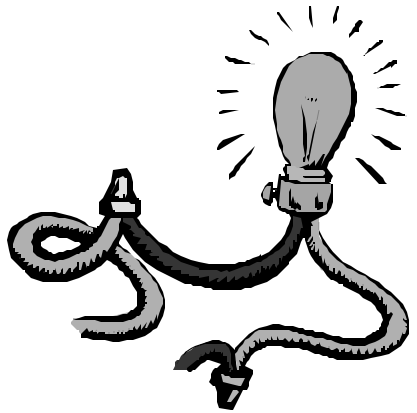
Present and Future

Ground Vehicle Applications

- **Transmission controls**
  - **Steering (both on-transmission and under-carriage)**
  - **Braking (service and parking)**
  - **Transmission select**
  - **Throttle**
- **Other Electromechanical Opportunities**
  - **Turret drives (elevation, traverse)**
  - **Automatic propellant handling systems**
  - **Fans and pumps**
- **Ground Vehicle Platforms**
  - **Army XXI and Army After Next combat vehicles**
  - **Unmanned ground vehicles**
  - **Specialized farm equipment**
  - **Automotive**

Drive-By-Wire Technology

- **Drive-By-Wire technology is a step forward in vehicle control methodology**
- **Similar electromechanical actuation schemes can be implemented across several platforms**



This is only the beginning.

Drive-By-Wire's potential has yet to be fully realized!